

REVISED DIRECT TESTIMONY AND EXHIBIT OF**PHILIP HAYET****ON BEHALF OF****THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF****DOCKET NO. 2019-224-E****DOCKET NO. 2019-225-E****IN RE: SOUTH CAROLINA ENERGY FREEDOM ACT (HOUSE BILL 3659)****PROCEEDING RELATED TO S.C. CODE ANN. SECTION 58-37-40 AND****INTEGRATED RESOURCE PLANS FOR DUKE ENERGY CAROLINAS, LLC****AND DUKE ENERGY PROGRESS, LLC****Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.**

A. My name is Philip Hayet and I am a Vice President and Principal of J. Kennedy and Associates, Inc. ("Kennedy and Associates"). My business address is 570 Colonial Park Drive, Suite 305, Roswell, Georgia, 30075.

Q. DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I received a Bachelor of Science degree in Electrical Engineering from Purdue University, and a Master of Science degree from the Georgia Institute of Technology, with a specialization in Power Systems Analysis. I have over forty (40) years of experience in the electric utility industry, having worked in the areas of resource planning, economic analysis, generation operations, rate analysis, and utility policy analysis. I was employed from 1979 to 1996 by Energy Management Associates ("EMA", now known as ABB Enterprise Software, Inc.), and I supported EMA's PROMOD IV™ ("PROMOD") and

1 STRATEGIST clients.¹ In 1996, I formed Hayet Power Systems Consulting (“HPSC”)
2 where I offered consulting services to clients in the United States and internationally. In
3 2000, I continued to work for HPSC, but I also joined the Kennedy and Associates’ firm.
4 In 2015, HPSC and Kennedy and Associates merged, and I became a Principal of Kennedy
5 and Associates. I have testified as an expert witness in numerous cases in states across the
6 United States, including Georgia, Indiana, Kentucky, Louisiana, Minnesota, Utah,
7 Wisconsin, Wyoming, and at the Federal Energy Regulatory Commission (“FERC”). A
8 summary of my education, experience, and expert testimony appearances is included in
9 Exhibit PH-1.

10 **Q. ON WHOSE BEHALF DO YOU PROVIDE THIS TESTIMONY?**

11 **A.** I am providing this testimony on behalf of the South Carolina Office of Regulatory
12 Staff (“ORS”).

13 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE**
14 **COMMISSION OF SOUTH CAROLINA (“COMMISSION”)?**

15 **A.** Yes, I testified in Dominion Energy South Carolina, Inc.’s 2020 IRP proceeding
16 (Docket No. 2019-226-E), and in Lockhart Power Company’s 2020 IRP proceeding
17 (Docket No. 2019-227-E). In addition, I have testified in numerous cases before eight (8)
18 state regulatory commissions and the FERC on similar issues as I am addressing in this
19 case.

20 **Q. DESCRIBE THE PURPOSE OF YOUR TESTIMONY.**

21 **A.** The purpose of my testimony is to describe Kennedy and Associates’ review of the

¹ PROMOD is a detailed hourly probabilistic production cost model, and STRATEGIST is a long-term resource optimization planning model.

Duke Energy Carolinas, LLC (“DEC”) and Duke Energy Progress, LLC (“DEP”) (collectively “Duke Energy” or the “Companies”) 2020 IRPs, including the assessment of the Companies’ compliance with the statutory requirements of S.C. Code Ann. Section 58-37-40 (“Section 40”), as amended by the South Carolina Energy Freedom Act (“Act 62”).

I worked closely with the ORS team, including Mr. Anthony Sandonato and others, and my colleagues, Mr. Stephen J. Baron, Mr. Lane Kollen, as well as other consultants at Kennedy and Associates. We prepared separate reports, entitled, “Review of Duke Energy Carolinas, LLC 2020 Integrated Resource Plan” (the “DEC Report”), and “Review of Duke Energy Progress, LLC 2020 Integrated Resource Plan” (the “DEP Report”), which include our findings, conclusions, and recommendations for the two Companies’ IRPs. These are referred to in my testimony jointly as the “ORS Reports.” A copy of each report is attached to ORS witness Sandonato’s direct testimony as his Exhibits AMS-1 and AMS-2.

Mr. Kollen and Mr. Baron also filed direct testimonies in this proceeding and discuss their responsibilities associated with the ORS Reports.

Q. DESCRIBE THE SCOPE OF KENNEDY AND ASSOCIATES’ REVIEW OF DEC’S AND DEP’S IRPS.

A. Kennedy and Associates performed a comprehensive review of the Companies’ planning process and IRP filing, and evaluated whether DEC and DEP complied with the requirements of Section 40. As part of the review, Kennedy and Associates investigated the historical context of the IRP process in South Carolina, including the Act 62 requirements, prior DEC and DEP IRP filings, and Commission Orders. Kennedy and Associates then reviewed the significant features of DEC’s and DEP’s IRPs, including the load and energy forecasting process, reserve margin policy, demand side management

1 (“DSM”) assumptions, natural gas and carbon dioxide (“CO₂”) price forecasting
2 methodologies, existing supply side resources, development of generic new supply side
3 resources, alternative resource plans that reflect the timing, type, size, and cost of new
4 resource additions and retirements of existing resources, production cost modeling, capital
5 revenue requirement analysis, economic analyses and ranking of expansion plan results,
6 transmission system planning process and potential investments, and plans for distribution
7 and integrated system operations planning. Based on the review, Kennedy and Associates
8 and ORS assessed if the Companies complied with the statutory requirements of Section
9 40, including the Act 62 amendments.

10 **Q. PLEASE PROVIDE A BRIEF SUMMARY OF THE CONCLUSIONS THAT**
11 **KENNEDY AND ASSOCIATES AND ORS REACHED.**

12 **A.** Kennedy and Associates and ORS concluded that the Companies complied with
13 the informational requirements identified in Sections 40(B)(1) and 40(B)(2). However,
14 there are improvements that could be made to the Companies IRPs in the areas of
15 assumptions and modeling methodologies, which would improve the Companies IRPs.
16 Specifically, the IRPs would benefit from more detailed information in technical
17 appendices and additional sensitivities to be evaluated. This information may be useful to
18 the Commission as it considers whether the DEC and DEP IRPs balance the seven factors
19 found in Section 40(C)(1).

20 Kennedy and Associates grouped the recommendations into two categories, ones
21 that are recommended to be addressed in a modified IRP in this proceeding, which are
22 identified in the ORS Reports with an “N” designation (“Now”), and ones that are
23 recommended to be addressed in a future IRP with guidance provided through the

Companies' stakeholder engagement process, which items are identified with an "L" designation ("Later"). The recommendations that could be addressed in a future IRP are no less important but recognize that the implementation of some of the recommendations could require more time and could benefit from guidance that could be provided by the stakeholder process.

Q. PLEASE PROVIDE A LIST OF RECOMMENDATIONS THAT WERE IDENTIFIED IN THE ORS REPORTS FOR DEC AND DEP TO ADDRESS IN THE FORM OF MODIFIED IRPS IN THIS PROCEEDING.

A. The recommendations are included in the following tables. The numbers correspond to the items that are found in the list in the Executive Summary section of the ORS Reports. The first table contains the items that we recommend be addressed by the Companies in these IRP proceedings, and the second contains the items that we recommend be addressed by the Companies possibly by the next annual IRP update that each Company will file, but no later than the next comprehensive IRP that each Company will file in 2023.

Item	Recommendations for DEC and DEP in this IRP
4	ORS recommends the Companies provide a detailed discussion in the IRP Report or appendices that explains how the results of the Astrapé 2018 Solar Capacity Value Study were used to derive the assumed winter peak standalone solar capacity value of 1%. We recommend this information be included in a modified IRP in this proceeding.
5	ORS recommends the Companies provide additional justification for selecting the Base Energy Efficiency ("EE")/Demand Side Management ("DSM") case as opposed to the High EE/DSM case for use in Portfolio A, given that the High EE/DSM case may provide greater customer benefits. We recommend this information be included in a modified IRP in this proceeding.

Item	Recommendations for DEC and DEP in this IRP (continued)
6	ORS recommends that in addition to the sensitivity cases included in Table A-9, the Companies also evaluate high and low levels of EE/DSM using high fuel/CO ₂ and low fuel/CO ₂ assumptions. We recommend this information be included in a modified IRP in this proceeding.
9	ORS recommends the Companies provide tables summarizing the capital and operations and maintenance (“O&M”) costs for compliance with environmental regulations by unit and by environmental regulation, and include descriptions explaining those costs. We recommend this information be included in a modified IRP in this proceeding.
10	To ensure there are no inconsistencies in modeling data, we recommend the Companies create a cross reference table that compares each resource modeled in PROSYM, including generating units, demand response, purchase contracts, sales contracts, EE, etc. to the corresponding data in the Load, Capacity and Reserves (“LCR”) table, on a resource by resource basis. We recommend this be developed for both the Base Case with CO ₂ and Base Case without CO ₂ cases, and cover all of the years in the study period. We recommend this information be provided in a modified IRP in this proceeding.
11	Recognizing that the Companies plan to pursue relicensing of the Oconee nuclear units’ operating licenses in 2021, we recommend the Companies supply additional information regarding its relicensing plans (including a timeline) and its plans to conduct economic evaluations to assess the benefits of relicensing the units. We recommend the Companies provide additional insight into why it is beginning this process so far in advance of the relicensing dates. We recommend this information be provided in a modified IRP in this proceeding.
12	DEC Only - The Bad Creek Pumped Hydro units’ licenses are set to expire in 2027. However, the IRP does not provide details on the relicensing status of these units. Since these units will need to go through a relicensing process with the FERC soon, we recommend that DEC provide the status of its plans to relicense the units, including any actions it will have to take as part of the relicensing process and any costs that it will incur to relicense the units. We recommend this information be provided in a modified IRP in this proceeding.

Item	Recommendations for DEC and DEP in this IRP (continued)
13	DEC Only - ORS recommends DEC provide additional clarification regarding its plans for the retirement of the Allen units, including details about any transmission impacts, an explanation of the steps being pursued to receive final approval within DEC and from any regulatory body, and a timeline for conducting these activities. We recommend this information be provided in a modified IRP in this proceeding.
14	ORS recommends the Companies provide evidence that the optimal retirement dates that were determined with the Sequential Peaker Method (“SPM”) are comparable to the optimal retirement dates the System Optimizer model would produce if it were used in the retirement study. We recommend this information be provided in a modified IRP in this proceeding.
15	ORS recommends the Companies supply additional information explaining the basis for how Combined Heat and Power (“CHP”) resources were added to the short-term action plan, and explain why CHP resources were not treated as selectable resources in the economic optimization process, if in fact they were not. We recommend this information be provided in a modified IRP in this proceeding.
16	ORS recommends the Companies provide additional justification for its Combustion Turbine (“CT”) capital cost assumption. We recommend this information be provided in a modified IRP in this proceeding.
17	ORS recommends the Companies provide additional justification for its Battery Energy Storage fixed O&M cost and capacity factor assumptions. We recommend this information be provided in a modified IRP in this proceeding.
18	ORS recommends the Companies include an additional solar generic resource option in its IRP modeling assumptions that reflects the kind of solar Purchase Power Agreements (“PPA”) prices that may be available in the market. As a proxy, the Companies could assume \$38/megawatt-hour (“MWh”) as the solar PPA cost. We recommend this be addressed in a modified IRP in this proceeding.

Item	Recommendations for DEC and DEP in this IRP (continued)
20	ORS recommends the Companies provide a table identifying each renewable resource option that was modeled, and include whether the resource was forced-in or economically selected (System Optimizer or other approach), the reason the resource was forced-in (e.g. Competitive Procurement of Renewable Energy Program (“CPRE”), Act 236, etc.), whether the resource is a designated, mandated, or undesignated resource, and where the resource is found in the PROSYM database and in the LCR tables for reconciliation purposes. We recommend this information be provided in a modified IRP in this proceeding.
21	ORS recommends the Companies include post in-service capital costs for new resource additions in its capital cost model and its Present Value of Revenue Requirement (“PVRR”) calculations for each Portfolio and each sensitivity of each Portfolio. We recommend this be addressed in a modified IRP in this proceeding.
22	The average retail rate impacts are an important consideration when assessing whether Portfolios and the pathways reflected in those Portfolios are reasonable. This should be considered in this IRP and future IRPs, but it does not require a modified IRP in this proceeding.
23	ORS recommends the Companies revise the calculation of the average retail rate impact on customers so that the assumptions and methodologies are consistent with the calculations of the PVRR, except for the levelization of the capital-related costs. We recommend this be included in a modified IRP in this proceeding.
24	ORS recommends the Companies provide additional details and status updates about resources included in the action plan, including coal retirements, the Lincoln CT project, unnamed energy storage projects, nuclear uprates, Bad Creek upgrades, and unnamed CHP projects. We recommend this information be included in a modified IRP in this proceeding.

Q. PLEASE PROVIDE A LIST THAT KENNEDY AND ASSOCIATES AND ORS RECOMMENDS BE ADDRESSED BY DEC AND DEP POSSIBLY BY THE NEXT ANNUAL IRP UPDATE, BUT NO LATER THAN THE NEXT COMPREHENSIVE IRP THAT EACH COMPANY WILL FILE BY 2023.

A. The items are included in the following table.

Item	Recommendations for DEC and DEP Future IRP
1	ORS recommends the Companies provide a technical appendix that more fully describes each of the models, presents the statistical results and shows the individual energy and peak load forecast results that were actually developed. While the Companies' IRPs provide an overview of this information, they do not provide the detail necessary to fully evaluate the entire forecast. This detail was provided in response to discovery in this proceeding, however, we recommend this level of detail be included in future IRPs as part of a comprehensive technical appendix.
2	ORS recommends the Companies provide a more detailed discussion of the specific methodology used to develop the synthetic loads for extreme low temperature periods. While the Resource Adequacy Report provides an overview of this issue, it does not provide sufficient detail regarding how the analysis was conducted or what specific additional adjustments were made to the load data at extreme low temperatures. This detail was provided in response to discovery in this proceeding; however, we recommend this level of detail be included in future IRPs as part of a comprehensive technical appendix.
3	ORS recommends the Companies further develop their methodology to model the effects of extreme low temperatures on winter peak load. Given the significance of this issue, as discussed in the ORS Reports, there may be alternative methodologies that the Companies could consider to develop its synthetic loads in hours in which the temperatures fall significantly below the temperatures experienced during the weather/load estimation period (i.e., neural net model training period). We recommend this be addressed in future IRPs through the Companies' stakeholder process.

Item	Recommendations for DEC and DEP Future IRP (continued)
7	The Companies provided no basis for the low EE/DSM forecast that it used in the IRP. The Companies' approach may be reasonable; however, it would be a better practice to provide more justification as to how it derived the low EE/DSM forecast. ORS recommends the Companies provide additional justification or consider other approaches for deriving the low EE/DSM forecast. We recommend this be addressed in future IRPs through the Companies' stakeholder process.
8	ORS recommends the Companies review their natural gas price forecasting methodology and investigate alternative approaches. We recommend this be addressed in future IRPs through the Companies' stakeholder process.
19	Given the importance that solar capacity values and solar plus battery energy storage capacity values potentially could have on the IRP analysis, ORS recommends that further investigation be conducted regarding these values with stakeholder input, discussed as part of a stakeholder engagement process. One investigation that could be performed would be to assess the impact on the Companies' base case resource plan if higher winter capacity value ratings were assumed such as 5% for solar and 30% for solar plus battery energy storage. We recommend this be addressed in the future through the Companies' stakeholder process.
25	ORS recommends that in future IRPs, the Companies provide details regarding the status of the Southeast Energy Exchange Market ("SEEM"), details regarding important current and planned activities, and information regarding the monetary benefits that have been or could be achieved by implementation of the SEEM. We recommend this be addressed in the future through the Companies' stakeholder process.

1 **Q. WHAT WERE YOUR PRIMARY RESPONSIBILITIES WITH REGARD TO THE**
2 **ORS REPORTS?**

3 **A.** I had the primary responsibility for developing the following sections of the ORS
4 Reports:

- 5 • Evolution of the IRP Process in South Carolina

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- Compliance with Requirements of Section 40
- EE and DSM
- Natural Gas Price Forecasts
- CO₂ and Other Environmental Issues
- Existing System Resources
- Generic Resource Options
- Renewables
- Transmission System Planning and Investments
- Distribution Resource and Integrated System Operations Plans
- Other Considerations

Mr. Baron and Mr. Kollen describe their responsibilities in their respective direct testimonies.

Q. PLEASE SUMMARIZE THE CONCLUSIONS KENNEDY AND ASSOCIATES AND ORS REACHED REGARDING EE AND DSM.

A. We evaluated the Companies' EE and DSM IRP modeling process, which was based upon the Market Potential Study ("MPS") conducted by Nexant, Inc. ("Nexant"). Nexant's MPS study determined technical, economic, and realistic achievable market potential savings for EE and DSM programs over a 25-year horizon. Nexant developed various scenarios that the Companies combined together with their current five (5) year EE/DSM plans for the 2020-2024 period, to develop Low, Base, and High EE/DSM scenarios that were then used in their IRP evaluations. The development of the Companies' Base EE/DSM scenario appears to be reasonable, as DEC's Base EE/DSM scenario, as one

1 example, assumes a substantial amount of EE savings will be achieved (1.29% of sales)
2 over the 2021-2035 period.²

3 **Q. PLEASE EXPLAIN YOUR RECOMMENDATIONS 5, 6, AND 7 CONCERNING**
4 **THE COMPANIES' EE/DSM MODELING.**

5 **A.** Recommendation 5 was proposed because of each Companies' decision not to
6 incorporate the High EE/DSM forecast in their respective Base Case Without CO₂
7 (Portfolio A) resource plans, but instead to include the Base EE/DSM forecast in their
8 respective Portfolio A resource plans. This is important because the Companies intend to
9 continue their historic practice of relying on the Base Case Without CO₂ resource plan for
10 for any avoided cost studies, solar capacity value assessments, DSM evaluations and
11 possibly other analyses that they perform in South Carolina.³ The Companies made this
12 decision despite the fact that sensitivity cases with the High EE/DSM forecast resulted in
13 lower costs than the other EE/DSM forecasts the Companies evaluated. The Companies'
14 reason for avoiding use of the High EE/DSM assumptions is based on their concern that
15 they could encounter difficulty achieving the high EE case results due to risks they could
16 encounter, which the Companies referred to as "executability risks."⁴ Since Portfolio A will
17 be used for several analyses in South Carolina, ORS recommends that the Companies
18 provide additional justification in this IRP for selecting the Base EE/DSM case as opposed
19 to the High EE/DSM case for use in Portfolio A, given that the High EE/DSM case may
20 provide greater customer benefits.

² North Carolina Public Staff Data Request 2-17.

³ ORS AIR 3-1d.

⁴ DEC 2020 IRP, pg. 172., and DEP 2020 IRP, pg. 170.

Recommendation 6 addresses the fact that while the Companies evaluated six (6) portfolios whose composition varied by the type of supply-side resources and amounts of EE/DSM included in the portfolios, and that were evaluated across different fuel/CO₂ forecasts, no sensitivity cases were evaluated that focused strictly on the benefits of EE/DSM across different fuel/CO₂ forecasts. ORS recommends that in addition to the sensitivity cases included in Table A-9, the Companies should also evaluate in this IRP, high and low levels of EE/DSM using high fuel/CO₂ and low fuel/CO₂ assumptions.

Recommendation 7 addresses the fact that the Companies provided no basis for the low EE forecast that were used other than to explain that the base EE/DSM forecast was scaled by 75% to derive the low EE/DSM forecast. This may be a reasonable estimate for the low EE/DSM forecast; however, it would be a better practice for the Companies to have more justification for how they derived the low EE/DSM forecast. ORS recommends the Companies provide additional justification, or consider other approaches for deriving the low EE/DSM forecast in the future. This could be done working through the Companies' stakeholder process in future IRPs.

Q. PLEASE EXPLAIN YOUR RECOMMENDATIONS CONCERNING THE COMPANIES' NATURAL GAS PRICE FORECASTS.

A. Recommendation 8 concerns the Companies' natural gas price forecasting methodology. We compared the Companies' Low, Base, and High Henry Hub natural gas price forecasts to other recent Henry Hub forecasts for other utilities that were obtained from publicly available sources and found that the Companies' three forecasts were consistently lower than the other utility forecasts over the period of 2021 to about 2034. After 2034, it appears the Companies' three forecasts ultimately trend towards the average

1 of all of the forecasts that were reviewed. Our conclusion is that, although the Companies'
2 three natural gas price forecasts do appear to be somewhat low over the planning horizon,
3 the natural gas forecasts do not appear to be outliers compared to the other forecasts.
4 However, there is a concern that low gas price forecasts could bias results in favor of
5 selecting too many natural gas-fired resources. The results suggest that it would be
6 worthwhile for the Companies to conduct further investigation of the natural gas
7 forecasting methodology, which ORS recommends be addressed in future IRPs through
8 the Companies' stakeholder process.

9 **Q. PLEASE EXPLAIN YOUR RECOMMENDATIONS CONCERNING CO₂ AND**
10 **OTHER ENVIRONMENTAL ISSUES.**

11 **A.** Recommendation 9 relates to Environmental issues. As part of our evaluation of
12 these issues, we first compared the Companies' CO₂ price forecasts to other publicly
13 available CO₂ forecasts and found the Companies' forecasts compared reasonably well to
14 the other forecasts. We then reviewed information the Companies provided regarding other
15 environmental regulations, such as the Environmental Protection Agency's Effluent
16 Limitation Guidelines ("ELG") and the Coal Combustion Residuals rules. The Companies
17 summarized those regulations in their IRP Reports, however, the Companies did not
18 include any discussions of the actual environmental capital and O&M costs they anticipate
19 will be incurred to comply with those rules or the costs that could potentially be avoided
20 by retiring coal units early. The Companies included the environmental capital and O&M
21 costs in their economic modeling analyses; however, ORS recommends that DEC provide
22 additional tables that summarize the capital and O&M costs for environmental compliance

1 by unit and by environmental regulation and include descriptions explaining those costs.

2 We recommend this information be included in a modified IRP in this proceeding.

3 **Q. PLEASE EXPLAIN YOUR RECOMMENDATIONS CONCERNING THE**
4 **COMPANIES' EXISTING SYSTEM RESOURCES.**

5 **A.** Based on our evaluation of the Companies' existing system resources, we proposed
6 five (5) recommendations. First, Recommendation 10 relates to inconsistencies that ORS
7 noticed based on a comparison of data the Companies supplied in different tables. Kennedy
8 and Associates attempted to compare resources and their associated capacity values in
9 PROSYM to the same resources that were included in the Companies' LCR tables.
10 Because of certain aggregations of data in both PROSYM and the LCR tables and for other
11 reasons, it was difficult to match up the information. To address these potential
12 inconsistencies in the modeling data, ORS recommends that, within this IRP, the
13 Companies create a cross reference table that compares each resource and the capacity of
14 those resources as modeled in PROSYM to the same resources included in the Companies'
15 LCR tables. ORS recommends this be done for both the Base Case with and the Base Case
16 without CO₂ portfolios and should encompass every year of the study period.

17 Recommendation 11 relates to the Companies' plans to relicense its nuclear units,
18 and in particular, DEC's Oconee units, which will be Duke Energy's first nuclear units to
19 go through the subsequent relicensing process. Section (B)(1)(f) requires utilities to
20 provide information concerning each generating unit's licensing status, and the Companies
21 complied by supplying information in Chapter 10 of their respective reports, entitled

1 “Nuclear and Subsequent License Renewal (SLR).” The Companies provided various
2 details of their relicensing plans which include:⁵

- 3 • All 11 nuclear units in Duke Energy’s operating fleet will be subsequently relicensed.
- 4 • A subsequent relicensing application is expected to take 5 years to go through the Nuclear
5 Regulatory Commission (“NRC”) relicensing process.
- 6 • Duke Energy plans to submit its first application for extension of the Oconee units in 2021
7 whose licenses will expire between 2033 and 2034.
- 8 • While Duke Energy’s plans call for the Oconee units to go first, DEP’s Robinson nuclear
9 unit license will expire earlier in 2030.

10 Given the impact of Duke Energy’s nuclear fleet on both Companies’ operations,
11 ORS seeks additional details to be included in future IRPs regarding the Companies’
12 subsequent relicensing plans. ORS recommends that the Companies supply a timeline
13 outlining its schedule for subsequent relicensing all of its nuclear units, discuss the costs it
14 anticipates will be incurred to relicense the units, and provide details of its plans to conduct
15 economic evaluations to assess the benefits of subsequent relicensing the units. ORS also
16 recommends the Companies provide additional insight into why it is beginning this process
17 so far in advance of the subsequent relicensing dates for the Oconee units given that it may
18 only take 5 year to relicense the units.

19 Recommendation 12 is specific to DEC and concerns the licensing status of DEC’s
20 Bad Creek Pumped Storage hydro units that will have to be relicensed in 2027. DEC
21 provided some details regarding the Bad Creek units as required by Section (B)(1)(f) such
22 as age, estimated remaining life and relicensing status. However, since those units will
23 need to go through a relicensing process with FERC soon in order to be relicensed by 2027,
24 ORS recommends that DEC provide the status of its plans to relicense the units, including

⁵ DEC 2020 IRP, pg. 76.

1 any actions it will have to take as part of the relicensing process and any costs that it will
2 incur to relicense the units.

3 Recommendation 13 is specific to DEC and concerns the retirement of the Allen
4 units. As part of DEC's 2020 IRP, DEC conducted an economic retirement study and
5 determined the most optimal retirement dates for Allen Units 2 through 4 would be
6 December 31, 2021, and for Allen Units 1 and 5 would be December 31, 2023.
7 Recommendation 13 seeks additional information regarding DEC's plans for the retirement
8 of the Allen Units. ORS recommends DEC provide details about any transmission impacts,
9 an explanation of the steps being pursued to receive final approval within the Companies
10 and from any regulatory body, and a timeline for conducting these activities. We
11 recommend this information be provided in a modified IRP.

12 Recommendation 14 concerns the Companies' economic coal retirement study.
13 The Companies evaluated coal retirements using an approach known as the SPM. The
14 SPM was not conducted entirely based on an optimization analysis using the Companies'
15 System Optimizer model, but instead it was conducted partly by performing a series of
16 production cost modeling runs using the Companies' PROSYM production cost model.⁶
17 The difference in the two approaches is that with the System Optimizer, the Companies
18 could have derived optimal resource plans, with and without the target retirement unit to
19 determine the optimal retirement date for the target retirement unit. With the SPM, the
20 Companies made the simple assumption that the replacement for the retired coal unit would
21 always be a CT unit. ORS recommends the Companies provide evidence in this IRP that

⁶ This process is discussed in the DEC Report at page 80.

the optimal retirement dates that were determined with the SPM are comparable to the optimal retirement dates the System Optimizer model would produce if it were used.

Q. PLEASE SUMMARIZE THE CONCLUSIONS AND RECOMMENDATIONS WITH RESPECT TO GENERIC RESOURCE OPTIONS.

A. With regard to generic resource options, ORS makes several recommendations in the ORS Reports. Recommendation 15 concerns CHP units that may have been “forced-in” to the Companies’ expansion plan, as opposed to having been economically selected in the Companies’ System Optimizer optimization model. The Short Term Action Plan shows that two 30 MW CHP units were added in 2022 and 2023. ORS recommends the Companies supply additional information in this IRP explaining the basis for how CHP resources were added to the Short-Term Action Plan, and explain why CHP resources were not treated as selectable resources in the economic optimization process.

ORS has four (4) additional generic resource recommendations that relate to the follow resources:

- The CT capital cost assumption.
- The Battery Energy Storage fixed O&M cost and capacity factor assumptions.
- The inclusion of a Solar generic PPA resource option.
- Solar capacity and Solar Plus Battery Storage Contribution to Winter Peak values (also referred to as “capacity value”).

Recommendation 16 concerns the CT capital cost assumption. ORS developed a comparison of generic resource option assumptions in Table 14 of its IRP Report to assess the reasonableness of the assumptions the Companies relied for their IRPs. From that table, it appears the Companies’ capital cost assumption for CT resources is lower than many of

1 the other estimates that are included in the table. ORS recommends the Companies provide
2 additional evidence in this IRP supporting its CT capital cost assumption. Capital costs
3 that are too low could bias results in favor of adding too many CT units to the portfolio.

4 Recommendation 17 concerns the battery energy storage fixed O&M cost and
5 capacity factor assumptions. Table 14 indicates that the Companies' battery energy storage
6 fixed O&M cost and capacity factor assumptions are considerably higher than many of the
7 other fixed O&M cost and capacity factor estimates that are included in the Table 14. ORS
8 recommends the Companies provide additional evidence in this IRP supporting these
9 assumptions.

10 Recommendation 18 concerns the cost of solar resources modeled in the analysis.
11 Only one solar resource was modeled in the Companies' optimization analysis, which is a
12 utility self-build solar option. The problem with that is demonstrated by the ORS Reports'
13 Table 14 Utility Solar comparisons, which indicates that the Companies' levelized cost of
14 energy ("LCOE") for their solar option is significantly higher than some of the other LCOE
15 assumptions found in Table 14, and in fact much higher than the \$38/MWh average price
16 for solar PPA resources that were selected in DEC and DEP's recent solar resource
17 solicitation that was conducted in North and South Carolina.⁷ This is clear evidence that
18 solar PPA prices can be considerably lower than the cost that Duke Energy can build solar
19 resources for, and indicates that both utility solar and solar PPA options should modeled in
20 the optimization analysis. ORS recommends that the Companies include an additional
21 solar generic resource option in its IRP modeling assumptions in this IRP that reflects the

⁷ See discussion at pg. 73 of the DEC Report.

1 kind of solar PPA prices that may be available in the market. As a proxy, the Companies
2 could assume \$38/MWh as the solar PPA cost.

3 Recommendation 19 relates to the Companies' solar capacity value and solar plus
4 battery storage capacity assumptions that were used. The Companies relied on its
5 consultant, Astrapé, to derive capacity value assumptions based on a SERVIM model
6 analysis that Astrapé performed. Based on the Astrapé results, the Companies' assumed
7 that solar capacity would provide 1% capacity value during the winter season, and solar
8 plus battery storage would provide 25% of the solar nameplate capacity towards meeting
9 winter peak demand. Given the importance that these assumptions potentially could have
10 on the IRP analysis, ORS recommends that further investigation be conducted regarding
11 these values with stakeholder input, discussed as part of a stakeholder engagement process.
12 One investigation that could be performed would be to assess the impact on the Companies'
13 base case resource plan if higher winter capacity value ratings were assumed such as 5%
14 for solar and 30% for solar plus battery energy storage. This investigation should be
15 discussed in a future IRP as part of the Company's stakeholder engagement process.

16 **Q. PLEASE DISCUSS YOUR FINDINGS CONCERNING RENEWABLE**
17 **RESOURCES.**

18 **A.** Recommendation 20 concerns renewable resources. The Companies' portfolios
19 incorporate several renewable resource types including solar, battery energy storage, solar
20 plus battery energy storage, offshore wind, Central-US wind, and pumped storage hydro.
21 Both solar and battery energy storage make up a sizable percentage of new renewable
22 resources that were added in each of the portfolios. However, not all of the renewable
23 resources were selected based on economics, in other words, many of the renewable

resources were “forced-in” to the Companies’ databases due to a combination of federal and state statutory and regulatory requirements. Examples of mandates that require resources to be acquired may be found in Table 15 of the ORS Reports. It is important to note that certain North Carolina statutes require more renewable resources to be added than would otherwise be required in South Carolina. For example, NC House Bill 589 requires both DEC and DEP to procure capacity in the aggregate amount of 2,660 MW (“initial Targeted Amount”) from renewable resources through a competitive procurement program known as the North Carolina CPRE program, which requires renewable capacity to be acquired over a term of 45 months in tranches starting from February 2018.

Q. THE REPORT DISCUSSES CHALLENGES ENCOUNTERED IN EVALUATING ALL OF THE RESOURCES. PLEASE BRIEFLY EXPLAIN THE CHALLENGES ENCOUNTERED AND THE RECOMMENDATION.

A. In expansion plan optimization modeling, there will always be some resources added to the database that were not economically selected. Examples of resources that will be added include those that are currently under construction or that will begin construction in the near future, contracts that will begin in the future, or resources that may be undesignated but that will have to be added to meet certain known regulatory or statutory obligations. Table 15 of the DEC’s Report, for example, indicates that by 2035, approximately 52% of solar resources that were added in the DEC’s Base Case with CO₂ plan were added in order to meet the statutory and regulatory requirements, and it is not clear how much of this added capacity would have been selected by an optimization model in the absence of these mandates. The Companies indicated that added resources could be broken into three categories:

- 1 1) Designated Resources – owned resources that the Companies have committed to add
2 or third-party resources with signed PPA contracts:
- 3 2) Mandated Resources – resources not yet under contract but are required under statutory
4 or regulatory requirements; and
- 5 3) Undesignated Resources – resources that will be added, for example, upon expiration
6 of designated resources.

7 It was difficult to identify all of the resources that were counted in the Companies' LCR
8 tables and to reconcile renewable resources in that table with resources that were modeled
9 in PROSYM. Furthermore, some of the tables, figures and discovery responses contain
10 results that do not appear to match. We recommend the Companies include tables in the
11 IRP that clearly identify the resources by categories. This will allow interested parties to
12 compare the resources modeled in the LCR table to PROSYM. By clearly identifying the
13 resources, the Companies clarify which resources were added and which were economic.
14 ORS's Recommendation 20 is that the Companies provide additional clarifying
15 information in a modified IRP containing a table that includes the following information:

- 16 • each renewable resource option that was modeled,
- 17 • whether the resource was forced-in or economically selected and the process by which
18 the resource was economically selected (System Optimizer or other approach),
- 19 • the reason the resource was forced-in (e.g. CPRE, Act 236, etc.),
- 20 • whether the resource is a designated, mandated, or undesignated resource, and,
- 21 • where the resource is found in the PROSYM database and in the LCR tables for
22 reconciliation purposes.

Q. PLEASE SUMMARIZE THE CONCLUSIONS AND RECOMMENDATIONS WITH RESPECT TO OTHER CONSIDERATIONS – STAKEHOLDER ENGAGEMENT, ACTION PLAN AND SEEM.

A. ORS presented several recommendations in the ORS Reports that may be addressed in future IRPs and may be addressed within the Companies’ stakeholder engagement process. ORS looks forward to addressing those issues with the Companies and other parties in the stakeholder engagement process.

ORS recommends the Short Term Action Plan be modified to include additional details and status updates about resources included in the action plan, including coal retirements, the Lincoln CT project, unnamed energy storage projects, nuclear uprates, Bad Creek upgrades, and unnamed CHP projects. ORS recommends the additional information be provided in a modified IRP in this proceeding.

Finally, the Companies are currently participating in the creation of the SEEM, and the Companies did not provide any details regarding the SEEM in this IRP. I am familiar with PacifiCorp’s participation in the Western Energy Imbalance Market (“Western EIM”). The SEEM will operate differently than the Western EIM; however, it is similar in that it is a platform that allows for participants to trade with neighboring utilities on a sub-hourly basis. I am also aware that PacifiCorp routinely provides information in its IRPs informing stakeholders about developments in the Western EIM. ORS recommends that in future IRPs, the Companies provide details regarding the status of the SEEM, details regarding important current and planned activities, and information regarding the monetary benefits that have been achieved by implementation of the SEEM.

Q. DOES THE ORS REVIEW ADDRESS THE NOTIFICATION FILED ON FEBRUARY 2, 2021 BY DEC INFORMING THE COMMISSION OF THE REVISED RETIREMENT DATE FOR ALLEN UNIT 3?

A. No. DEC filed a letter with the Commission on February 2, 2021, accelerating the retirement date of the coal unit, Allen Unit 3, from December 31, 2021 to March 31, 2021. However, the 2020 IRP reflects the retirement date of Allen Unit 3 as December 31, 2021. Given the timing of DEC's filing, ORS performed its review and analysis based upon the 2020 IRP retirement assumptions. After an initial review of the February 2, 2021 notification of the revised retirement date for Allen Unit 3, it is ORS's opinion that the earlier retirement of this coal unit will not impact ORS's recommendations. However, ORS reserves its rights to update its analysis and testimony should it be necessary.

Q. WILL YOU UPDATE YOUR DIRECT TESTIMONY BASED ON INFORMATION THAT BECOMES AVAILABLE?

A. Yes. ORS fully reserves the right to revise its recommendations via supplemental testimony should new information not previously provided by the Companies, or other sources, becomes available.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

QUALIFICATIONS OF PHILIP HAYET

EDUCATION/CERTIFICATION

M.S., Electrical Engineering, Georgia Institute of Technology, 1980
B.S., Electrical Engineering, Purdue University, 1979
Cooperative Education Certificate, Purdue University, 1979

PROFESSIONAL AFFILIATIONS

National Society of Professional Engineers
Georgia Society of Professional Engineers
Institute of Electrical and Electronic Engineers

EXPERIENCE

After completing his Master's degree, Mr. Hayet worked for fifteen years at Energy Management Associates, now Ventyx, providing consulting services and client service support to electric utility companies for the widely used planning models, PROMOD IV and STRATEGIST. Mr. Hayet had an instrumental role in designing some of the modeling features of those tools including the competitive market modeling logic in STRATEGIST.

In 1996, Mr. Hayet formed the utility consulting firm, Hayet Power Systems Consulting ("HPSC"), and worked for clients in the United States, and internationally in Australia, Japan, Singapore, Malaysia, the United Kingdom, and Vietnam. Mr. Hayet's expertise covers a number of areas including utility system planning and operations, RTO analysis, market price forecasting, Integrated Resource Planning, renewable resource evaluation, transmission planning, demand-side analysis, and economic analysis.

In 2000, Mr. Hayet also joined the consulting firm of J. Kennedy & Associates, Inc. ("Kennedy and Associates") and assisted on projects that required utility resource planning, analysis, and software modeling expertise. Mr. Hayet merged his firm and became a Vice-President and Principal of Kennedy and Associates in 2015. Mr. Hayet has provided consulting services to Public Utility Commissions, Regional Power Pools, State Energy Offices, Consumer Advocate Offices, Global Power Developers, and Industrial Companies.

Mr. Hayet has conducted numerous consulting studies in the areas of RTO Cost/Benefit Analysis, Renewable Resource Evaluation, Renewable Portfolio Standards Evaluation, Electric Market Price Forecasting, Generating Unit Cost/Benefit Analysis, Integrated Resource Planning, Demand-Side Management, Load Forecasting, Rate Case Analysis and Regulatory Support.

QUALIFICATIONS OF PHILIP HAYET

**2000 to Present: J. Kennedy and Associates, Inc.
Vice President and Principal**

- Initially began as Director of Consulting, became Vice President and Principal in 2015
- Managed electric related consulting projects.
- Responsible for business development.
- Clients include Staffs of Public Utility Commissions and other State Agencies, State Energy Offices, Global Power Developers, and Industrial Groups, and large energy users.

**1996 to Present: Hayet Power Systems Consulting
President and Principal**

- Managed electric utility related consulting projects
- Clients include Staffs of Public Utility Commissions and other State Agencies, State Energy Offices, Global Power Developers, and Industrial Groups, and large energy users.

**1991 to 1996: EDS Utilities Division, Atlanta, GA (Now Ventyx)
Lead Consultant, STRATEGIST Department**

- Managed a client services software team that supported approximately 75 users of the STRATEGIST electric utility strategic planning software.
- Participated in the development of STRATEGIST's competitive market modeling features and the Network Economy Interchange Module
- Provided client management direction and support and developed new consulting business opportunities.
- Performed system planning consulting studies including integrated resource planning, DSM analysis, marketing profitability studies, optimal reserve margin analyses, etc.
- Based on experience with PROMOD IV, converted numerous PROMOD IV databases to STRATEGIST, and performed benchmark analyses of the two models.

**1988 to 1991: Energy Management Associates (EMA), Atlanta, GA
Manager, Production Analysis Department**

- Served as Project Manager of a database modeling effort to create an integrated utility operations and generation planning database. Database items were automatically fed into PROMOD IV.
- Supervised and directed a staff of five software developers working with a 4GL database programming language.

QUALIFICATIONS OF PHILIP HAYET

- Interfaced with clients to determine system software specifications, and provide ongoing client training and support

1980 to 1988: **Energy Management Associates (EMA), Atlanta, GA**
Senior Consultant, PROMOD IV Department

- Provided client service support to EMA's base of over 70 electric utility customers using the PROMOD IV probabilistic production cost simulation software.
- Provided consulting services in a number of areas including generation resource planning, regulatory support, and benchmarking.

TESTIMONY AND EXPERT WITNESS APPEARANCES

Date	Case	Jurisdicit	Party	Utility	Subject
09/98	97-035-01	UT	Utah Committee for Consumer Services	PacifiCorp	Utah jurisdictional Net Power Costs, PacifiCorp Rate Case Proceeding
07/01	01-035-01	UT	Utah Committee for Consumer Services	PacifiCorp	Utah Jurisdictional Net Power costs in General Rate Case
2001	ER00-2854-000	FERC	Louisiana Public Service Commission	Entergy	Proposed System Agreement Modifications
07/02	02-035-002	UT	Utah Committee for Consumer Services	PacifiCorp	Special contract for industrial consumer
2002/ 2003	U-25888	LA	Louisiana Public Service Commission	Entergy	Investigation of retail issues related to the System Agreement
2003	U-27136 Subdocket A	LA	Louisiana Public Service Commission Staff	Entergy	Aging gas steam-fired retirement study
07/03	EL01-88-000	FERC	Louisiana Public Service Commission	Entergy	Rough production cost equalization proceeding
05/04	03-035-14	UT	Utah Committee for Consumer Services	PacifiCorp	Development of a large QF avoided cost methodology
06/04	18687-U 18688-U	GA	Georgia Public Service Commission Staff	Georgia Power and Savannah Electric	2004 Integrated Resource Planning Studies

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdicit	Party	Utility	Subject
08/04	ER03-583-000	FERC	Louisiana Public Service Commission	Entergy	Affiliate power purchase agreements
11/04	03-035-19	UT	Utah Committee for Consumer Services	PacifiCorp	Industrial customer's request for a special economic development tariff
11/04	03-035-38	UT	Utah Committee for Consumer Services	PacifiCorp	Large QF proceeding.
03/05	03-035-14	UT	Utah Committee for Consumer Services	PacifiCorp	Concerning PacifiCorp's Schedule 38 avoided cost tariff and remaining unsubscribed capacity
07/05	03-035-14	UT	Utah Committee for Consumer Services	PacifiCorp	Concerning PacifiCorp's Schedule 38 avoided cost proceeding
12/05	04-035-42	UT	Utah Committee for Consumer Services	PacifiCorp	Net power costs in General Rate Case
04/06	05-035-54	UT	Utah Committee for Consumer Services	PacifiCorp	Certification request to expand Blundell Geothermal Power Station. Related to Mid-American Energy Holding's Acquisition of PacifiCorp
05/06	22403-U	GA	Georgia Public Service Commission Staff	Georgia Power and Savannah Electric	March 2006 fuel cost recovery filing
2006	06-35-01	UT	Utah Committee for Consumer Services	PacifiCorp	2006 rate case, net power costs
08/06	U-21453	LA	Louisiana Public Service Commission Staff	Entergy Gulf States	Jurisdictional separation.
11/06	U-25116	LA	Louisiana Public Service Commission Staff	Entergy Louisiana	Fuel adjustment clause filings
01/07	23540-U	GA	Georgia Public Service Commission Staff	Georgia Power	November 2005 fuel cost recovery filing
04/07	07-035-93	UT	Utah Committee for Consumer Services	PacifiCorp	General Rate Case

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdicit	Party	Utility	Subject
06/07	24505-U	GA	Georgia Public Service Commission Staff	Georgia Power	2007 Integrated Resource Planning
10/07	U-30334	LA	Louisiana Public Service Commission Staff	Cleco Power	2008 Short-Term RFP
04/08	26794-U (FCR-20)	GA	Georgia Public Service Commission Staff	Georgia Power	Fuel cost recovery filing
2008	6630-CE-299	WI	Wisconsin Industrial Energy Group, Inc.	WEPCO	Certification Proceeding for environmental upgrades at Oak Creek power plant
07/08	ER07-956	FERC	Louisiana Public Service Commission	Entergy	2006 rough production cost equalization compliance filing in the System Agreement case
09/08	6680-CE-180	WI	Wisconsin Industrial Energy Group, Inc.	Wisconsin Power and Light	Certification proceeding concerning Nelson-Dewey coal-fired generating unit
11/08	08-1511-E-GI	WV	West Virginia Energy Users Group	Allegheny Power	Fuel cost recovery filing
12/08	27800-U	GA	Georgia Public Service Commission Staff	Georgia Power	Vogtle 3 and 4 nuclear unit certification proceeding
2008	08-035-35	UT	Utah Committee for Consumer Services	PacifiCorp	Chehalis Combine Cycle Power Plant based on a waiver of the RFP solicitation process certification proceeding
07/09	ER08-1056	FERC	Louisiana Public Service Commission	Entergy	2007 rough production cost equalization compliance filing in the System Agreement case
07/09	U-30975	LA	Louisiana Public Service Commission Staff	SWEPCO and Cleco	Application to acquire the Oxbow Mine to supply Dolet Hills Power Station certification proceeding
09/09	E015/PA-09-526	MN	Large Power Intervenor	Minnesota Power	Request for approval to purchase Square Butte's 500 kV DC transmission line, restructure a coal based power purchase agreement
09/09	09-035-23 Direct	UT	Utah Office of Consumer Services	PacifiCorp	2009 rate case, net power costs

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdic	Party	Utility	Subject
10/09	09A-415E	CO	Public Utilities Commission of Colorado	Black Hills/Colorado	CPCN application to construct two LMS 100 natural gas combustion turbine units
10/09	09-035-23 Surrebuttal	UT	Utah Office of Consumer Services	PacifiCorp	2009 rate case, net power costs
12/09	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	First Semi-Annual Vogtle Construction Monitoring Report
12/09	ER08-1224	FERC	Louisiana Public Service Commission	Entergy	2008 production costs used to develop bandwidth payments
2009	09-2035-01	UT	Utah Office of Consumer Services	PacifiCorp	2008 IRP
01/10	28945-U	GA	Georgia Public Service Commission Staff	Georgia Power	Fuel cost recovery filing
2010	EL09-61	FERC	Louisiana Public Service Commission	Entergy	System Agreement, individual operating company sales
06/10	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Second Semi-Annual Vogtle Construction Monitoring Report
12/10	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Third Semi-Annual Vogtle Construction Monitoring Report
01/11	ER09-1350 Direct	FERC	Louisiana Public Service Commission	Entergy	2008 production costs used to develop bandwidth payments
02/11	ER09-1350 Cross-Answering	FERC	Louisiana Public Service Commission	Entergy	2008 production costs used to develop bandwidth payments
04/11	33302-U (FCR-22)	GA	Georgia Public Service Commission Staff	Georgia Power	Fuel cost recovery filing
06/11	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Fourth Semi-Annual Vogtle Construction Monitoring Report
09/11	U-31892	LA	Louisiana Public Service Commission Staff	Cleco Power	Settlement agreement, CPCN to upgrade Madison 3 coal unit to accommodate biomass fuel

J. Kennedy and Associates, Inc.

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdicit	Party	Utility	Subject
11/11	26550-U	GA	Georgia Public Service Commission Staff	Georgia Power	Reacquisition of wholesale block capacity
11/11	34218-U	GA	Georgia Public Service Commission Staff	Georgia Power	Decertification of two aging coal units, acquire PPA resources, approve IRP update
12/11	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Fifth Semi-Annual Vogtle Construction Monitoring Report
03/12	U-32148	LA	Louisiana Public Service Commission Staff	Entergy	Change of Control Proceeding to move to Midwest ISO
2012	20000-EA-400-11	WY	Wyoming Industrial Energy Consumers	Rocky Mountain Power	Certification of environmental upgrades at Naughton 3
05/12	35277-U (FCR-23)	GA	Georgia Public Service Commission Staff	Georgia Power	Fuel cost recovery filing
05/12	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Sixth Semi-Annual Vogtle Construction Monitoring Report
07/12	2012-00063	KY	Kentucky Industrial Utility Customers, Inc.	Big Rivers	Environmental upgrades in compliance with MATS and CSAPR
09/12	U-32275	LA	Louisiana Public Service Commission Staff	Dixie Electric Member Cooperative	Ten year power supply acquisition certification proceeding
12/12	EL09-61-002 Direct	FERC	Louisiana Public Service Commission	Entergy	Harm calculation, violation of System Agreement
12/12	U-32557	LA	Louisiana Public Service Commission Staff	Entergy	Certification of 28 MW PPA for renewable energy capacity (RAIN waste heat) in accordance with LPSC's Renewable Energy Pilot
12/12	U-29764	LA	Louisiana Public Service Commission Staff	Entergy	Retail proceeding regarding termination of cross-PPAs
12/12	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Seventh Semi-Annual Vogtle Construction Monitoring Report

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdicit	Party	Utility	Subject
03/13	EL09-61-002 Cross-Answering	FERC	Louisiana Public Service Commission	Entergy	Harm calculation, violation of System Agreement
04/13	2012-00578	KY	Kentucky Industrial Utility Customers, Inc.	Kentucky Power Company	Mitchell Certificate of Public Convenience and Necessity
05/13	36498-U	GA	Georgia Public Service Commission Staff	Georgia Power	2013 IRP and request to decertify over 2,000 MW of coal-fired capacity
07/13	U-32785	LA	Louisiana Public Service Commission Staff	Entergy	8.5 MW PPA for renewable energy capacity (Agrilectric rice hull) in accordance with LPSC's Renewable Energy Pilot
08/13	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Eighth Semi-Annual Vogtle Construction Monitoring Report
10/13	2013-00199	KY	Kentucky Industrial Utility Customers, Inc.	Big Rivers	Base rate case
05/14	13-035-184	UT	Utah Office of Consumer Services	PacifiCorp	2014 General Rate Case, net power cost
06/14	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Ninth/Tenth Semi-Annual Vogtle Construction Monitoring Report
07/14	20000-446-EA-14	WY	Wyoming Industrial Energy Consumers	PacifiCorp	2014 General Rate Case, net power cost
08/14	2000-447-EA-14	WY	Wyoming Industrial Energy Consumers	PacifiCorp	2014 Energy Cost Adjustment Mechanism application
08/14	14-035-31	UT	Utah Office of Consumer Services	PacifiCorp	2014 Energy Balancing Adjustment application
09/14	ER13-432	FERC	Louisiana Public Service Commission	Entergy	Allocation of Union Pacific Settlement Agreement benefits
10/14	2014-00225	KY	Kentucky Industrial Utility Customers, Inc.	Kentucky Power	Kentucky Power Company's Fuel Adjustment Clause

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdic	Party	Utility	Subject
12/14	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Eleventh Semi-Annual Vogtle Construction Monitoring Report
05/15	14-035-140	UT	Utah Office of Consumer Services	PacifiCorp	Solar and wind capacity contribution avoided cost proceeding.
06/15	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Twelfth Semi-Annual Vogtle Construction Monitoring Report
08/15	15-035-03	UT	Utah Office of Consumer Services	PacifiCorp	2015 Energy Balancing Adjustment application
09/15	14-035-114	UT	Utah Office of Consumer Services	PacifiCorp	Cost and Benefits of PacifiCorp's Net Metering Program
11/15	39638-U	GA	Georgia Public Service Commission Staff	Georgia Power	FCR-24 Fuel Cost Recovery Proceeding
11/15	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Thirteenth Semi-Annual Vogtle Construction Monitoring Report
5/16	40161	GA	Georgia Public Service Commission Staff	Georgia Power	Georgia Power Company's 2016 IRP and Application for Decertification of Plant Mitchell Units 3, 4A, and 4B, Kraft Unit 1 CT, and Intercession City CT
6/16	29849	GA	Georgia Public Service Commission Staff	Georgia Power	Fourteenth Semi-Annual Vogtle Construction Monitoring Report
8/16	16-035-27	UT	Utah Office of Consumer Services	PacifiCorp	Renewable Energy Services Contract between Rocky Mountain Power and Facebook, Inc
8/16	16-035-01	UT	Utah Office of Consumer Services	PacifiCorp	2016 Energy Balancing Adjustment application
9/16	09-035-15	UT	Utah Office of Consumer Services	PacifiCorp	EBA Pilot Evaluation Direct Testimony
11/16	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Fifteenth Semi-Annual Vogtle Construction Monitoring Report
11/16	09-035-15	UT	Utah Office of Consumer Services	PacifiCorp	EBA Pilot Evaluation Rebuttal Testimony
11/16	EL09-61-04	FERC	Louisiana Public Service Commission	Entergy	Violation of System Agreement, Phase III, Harm Calculation, Direct

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdicit	Party	Utility	Subject
3/17	EL09-61-04	FERC	Louisiana Public Service Commission	Entergy	Violation of System Agreement, Phase III, Harm Calculation, Rebuttal
6/17	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Sixteenth Semi-Annual Vogtle Construction Monitoring Report
9/17	17-035-39	UT	Utah Office of Consumer Services	PacifiCorp	Approval of Resource Decision to Repower Wind Facilities, Direct
11/17	17-035-39	UT	Utah Office of Consumer Services	PacifiCorp	Approval of Resource Decision to Repower Wind Facilities, Surrebuttal
4/18	17-035-39	UT	Utah Office of Consumer Services	PacifiCorp	Approval of Resource Decision to Repower Wind Facilities, Response
4/18	17-035-39	UT	Utah Office of Consumer Services	PacifiCorp	Approval of Resource Decision to Repower Wind Facilities, Rebuttal to Response
12/17	17-035-40	UT	Utah Office of Consumer Services	PacifiCorp	Approval of Resource Decision for New Wind and New Transmission, Direct
1/18	17-035-40	UT	Utah Office of Consumer Services	PacifiCorp	Approval of Resource Decision for New Wind and New Transmission, Rebuttal
4/18	17-035-40	UT	Utah Office of Consumer Services	PacifiCorp	Approval of Resource Decision for New Wind and New Transmission, Second Rebuttal
6/18	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Eighteenth Semi-Annual Vogtle Construction Monitoring Report
8/18	Cause 45052	IN	Indiana Coal Council	Vectren Energy Delivery of Indiana	Request for Approval of an 850 MW CCGT Plant
9/18	U-34836	LA	Louisiana Public Service Commission Staff	Entergy Louisiana, LLC	Authorization to Participate in a 50 MW Solar PPA
11/18	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Nineteenth Semi-Annual Vogtle Construction Monitoring Report
1/19	U-35019	LA	Louisiana Public Service Commission Staff	Entergy Louisiana	Authorization to Make Available Experimental Renewable Option and Rate Schedule RTO
4/19	42310-U	GA	Georgia Public Service Commission Staff	Georgia Power	Georgia Power's 2019 IRP Proceeding

QUALIFICATIONS OF PHILIP HAYET

Date	Case	Jurisdicit	Party	Utility	Subject
11/19	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Twenty/Twenty-First Semi-Annual Vogtle Construction Monitoring Report
5/20	43011-U	GA	Georgia Public Service Commission Staff	Georgia Power	Georgia Power Fuel Cost Recovery Application (FCR-25)
6/20	29849-U	GA	Georgia Public Service Commission Staff	Georgia Power	Twenty-Second Semi-Annual Vogtle Construction Monitoring Report
9/20	17-035-61	UT	Utah Office of Consumer Services	PacifiCorp	Approval of an Export Credit Rate for Customer Generators (Primarily Rooftop Solar)
10/12	2019-226-E	SC	South Carolina Office of Regulatory Services	Dominion Energy South Carolina	Review of DESC's 2020 IRP

ADDITIONAL JUDICIAL PROCEEDINGS AND OTHER PROJECT INFORMATION

- 1995 – 2000 - Modeled the Singapore Power Electricity System and analyzed the benefits of dispatching a new oil-fired unit within the system, BHP Power
- 1995 – 2000 - Modeled the Australian National Energy Market to develop market based energy price forecasts on behalf of an Independent Power Producer in Australia, BHP Power
- 1995 – 2000 - Analyzed the benefit of purchasing existing gas-fired steam turbine units within the Australian market, BHP Power
- 1995 – 2000 Developed market price forecasts for South Australia as part of the evaluation of a new gas fired combined cycle unit, BHP Power
- 1995 – 2000 - Modeled the Vietnam Electricity System as part of a project to develop Least Cost Expansion plans for Vietnam, EVN State Utility
- 1995 – 2000 - Assisted in the evaluation of Phu My CCGT power plant in Vietnam, BHP Power
- 1995 – 2000 - Assisted in the development of Market Price Forecasts in several regions of the US. These forecasts were used as the basis for stranded cost estimates, which were filed in testimony in a number of jurisdictions across the country.
- 1995 – 2000 - Conducted research regarding ISO Tariffs and Operations for the PJM Power Pool, the California ISO, and the Midwest ISO on behalf of a Japanese Research.

QUALIFICATIONS OF PHILIP HAYET

- 1995 – 2000 - Performed research on numerous electric utility issues for 3 Japanese research organizations. This was primarily related to deregulation issues in the US in anticipation of deregulation being introduced in Japan.
- 1995 – 2000 - Critiqued the IRP filings of 5 utilities in South Carolina on behalf of the South Carolina State Energy Office
- 1999 - Helped to analyze the rate structure and develop an electricity price forecast for the Metropolitan Atlanta Rapid Transit Authority (MARTA) in Atlanta, Georgia
- August 2002 – Expert Report, Civil Action No. 1:00-cv-1262 in the United States District Court for the Middle District of North Carolina, United States v. Duke Energy Corporation, Department of Justice
- 2002 - Worked on behalf of the Utah Committee of Consumer Services to provide guidance and assist in the analysis of PacifiCorp's 2002 Integrated Resource Plan.
- July 2003 - Worked on behalf of the Oregon Public Utility Commission to Audit PacifiCorp's Net Power Costs per a Settlement Agreement accepted by the Public Utility Commission of Oregon in its Order No. 01-787. Audit report in Docket No. UE-116 filed July 2003.
- 2003 - Regulatory support to the Utah Committee of Consumer Services regarding PacifiCorp's 2003 Utah General Rate Case Docket # 03-2035-02.
- 2004 – Assistance to the Utah Committee of Consumer Services to analyze a series of power purchase agreements and special contracts between PacifiCorp and several of its industrial customers.
- 2005 - Worked on behalf of the Utah Committee of Consumer Services to help analyze PacifiCorp's restructuring proposals.
- 2005 - Assisted the Utah Committee of Consumer Services by evaluating PacifiCorp's 2005 IRP and assisted in writing comments that were filed with the Commission.
- 2007 - Assisted the Utah Committee of Consumer Services to evaluate PacifiCorp's 2007 IRP.
- 2007 - Conducted an investigation of the Southern Company interchange accounting and fuel accounting practices on behalf of the Georgia Public Service Commission Staff (Docket 21162-U).
- 2008 - Assisted the Louisiana Public Service Commission Staff with the review and evaluation of Cleco Power's 2008 Short Term RFP and its 2010 Long-Term RFP.
- 2008 - Assisted the Utah Committee of Consumer Services by participating in a collaborative process to develop an avoided cost tariff for large QFs.
- 2008 - Assisted the Louisiana Public Service Commission Staff with a rulemaking for the opportunity to implement a Renewable Portfolio Standard in Louisiana. (Docket No. R-28271 Sub-Docket B)

QUALIFICATIONS OF PHILIP HAYET

- April 2011 – Initial Expert Report, Civil Action No. 2:10-cv-13101-BAF-RSW, on behalf of the Department of Justice in US District Court, United States v. Detroit Edison
- June 2011 – Rebuttal Expert Report, Civil Action No. 2:10-cv-13101-BAF-RSW, on behalf of the Department of Justice in US District Court, United States v. Detroit Edison
- 2011 - Assisted the Georgia Public Service Commission Staff to investigate the acquisition of additional coal and combustion turbine capacity currently wholesale capacity (Docket 26550).
- 2012 - Assisted the Louisiana Public Service Commission Staff with a rulemaking to design Integrated Resource Planning (“IRP”) rules. (Docket No. R-30021)
- December 2013 – Expert Report, Civil action no. 4:11-cv-00077-RWS, on behalf of the Department of Justice in US District Court, United States v. Ameren Missouri.

PUBLICATIONS AND PRESENTATIONS

Co-authored “Review of EPA’s Section 111(d) CO₂ Emission Rate Goals for the State of Montana, on behalf of the Montana Large Customer Group, October 2014.

Authored “Singapore’s Developing Power Market”, which appeared in the July/August 1999 edition of Power Value Magazine

Co-authored “The New Energy Services Industry – Part 1”, which appeared in the January/February 1999 edition of Power Value Magazine.

Co-authored and Presented “Evaluation of a Large Number of Demand-Side Measures in the IRP Process: Florida Power Corporation’s Experience”, Presented at the 3rd International Energy and DSM Conference, Vancouver British Columbia, November 1994

Co-authored “Impact of DSM Program on Delmarva’s Integrated Resource Plan”, Published in the 4th International Energy and DSM Conference Proceedings, held in Berlin, Germany, 1995

Presentation – Law Seminars International, Electric Utility Rate Cases, Case Study of the Louisiana Public Service Commission’s Quick Start Energy Efficiency Program, March 2015.